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## WHAT IS CLAIMED IS:

1. A method of processing a semiconductor wafer that reduces plasma-induced damage to the wafer comprising performing the following while maintaining a plasma in a reaction chamber:

inserting the wafer into the reaction chamber;

performing a plasma process on the wafer at a process temperature;

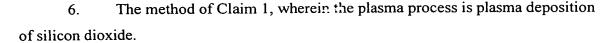
cooling the wafer to a removal temperature which is less than the process temperature; and

removing the wafer from the reaction chamber.

- 2. The method of Claim 1, wherein the removal temperature is at least between about 100°C and about 500°C below the process temperature.
- The method of Claim 1, wherein the process temperature is greater than about 300°C and the removal temperature is less than about 300°C.
  - 4. The method of Claim 1, wherein the removal temperature is between about 80°C and about 300°C.
  - 5. The method of Claim 1, further comprising cooling the wafer to between about 15°C and 30°C before inserting the wafer into the reaction chamber.

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- 7. The method of Claim 6, wherein the process temperature is between about 275°C and 325°C.
  - 8. The method of Claim 1, wherein the plasma process is plasma deposition of fluorine doped silicon dioxide.
- 10 9. The method of Claim 8, wherein the process temperature is between about 325°C and about 375°C.
  - 10. The method of Claim 1, wherein the plasma process is plasma deposition of silicon dioxide for shallow trench isolation.
  - 11. The method of Claim 10, wherein the process temperature is between about 400°C and about 550°C.
- 12. The method of Claim 1, wherein the plasma process is plasma deposition of phosphorous-doped silicon dioxide.
  - 13. The method of Claim 12, wherein the process temperature is between about 400°C and about 550°C.

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- 14. The method of Claim 1, wherein the plasma process is plasma etch of photoresist.
- 5 15. The method of Claim 1, wherein cooling the wafer to a removal temperature is cooling the wafer for between about 2 seconds and about 30 seconds.
  - 16. The method of Claim 1, wherein cooling the wafer to a removal temperature comprises blowing a gas over the wafer.
  - 17. The method of Claim 1, wherein an idle plasma condition is used while inserting the wafer, cooling the wafer, and removing the wafer.
- 18. The method of Claim 1, wherein the wafer comprises a gate dielectric layer.
  - 19. A method of processing a semiconductor wafer that reduces plasmainduced damage to the wafer comprising:

cooling the wafer to a temperature below about 100°C;

transferring the wafer into a reaction chamber;

igniting a plasma within the reaction chamber;

performing a plasma process on the wafer at a process temperature;



M-11543 US 756751 vl

cooling the wafer to a removal temperature which is less than the process temperature while maintaining the plasma; and

removing the wafer from the reaction chamber.

5 20. The method of Claim 19 wherein the plasma is extinguished while removing the wafer from the reaction chamber.